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EXAMINER	
BIRBACH, NAOMI L	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

DocketingDept@young-thompson.com

Office Action Summary	Application No.	Applicant(s)	
	10/560,812	OBWEGER ET AL.	
	Examiner	Art Unit	
	NAOMI BIRBACH	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 April 2009 and 11 September 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-18,20-25,27-35 and 37* is/are pending in the application.

4a) Of the above claim(s) *18,20,21,32-35 and 37* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-17,22-25 and 27-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *04222009, 07102009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-17, 22-25, 27-31, in the reply filed on 9/11/2009 is acknowledged. The traversal is on the grounds that no burden is placed on the examiner because all of the claims of Groups I and II have been considered. This is not found persuasive because the application is a national stage application submitted under 35 U.S.C. 371. Therefore, the question of burden is irrelevant since the grounds of restriction for a national stage application are based on a lack of unity of invention. Applicant additionally argues that the International Search Report did not set forth separate inventions for the PCT application which contained both apparatus and method claims. If the examiner finds that a national stage application lacks unity of invention under § 1.475, the examiner may in an Office action require the applicant in the response to that action to elect the invention to which the claims shall be restricted. Such requirement may be made before any action on the merits but may be made at any time before the final action at the discretion of the examiner. Therefore, it is clear that the examiner may issue a restriction during the national stage examination, even if not restricted during the international examination. See MPEP 1893.03(d) [R-7]. Finally, Applicant argues that patents in this field of endeavor are issued which contain both apparatus and method claims. However, Examiner is not bound by the decisions of other examiners and thus this argument is irrelevant.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 18, 20, 21, 32-35 and 37 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or

linking claim. Applicant timely traversed the restriction requirement in the reply filed on 9/11/09.

Response to Amendment

3. Claims 1, 2, 4-17, 22-25 and 27-31 are pending. Claims 18, 20, 21, 32-35 and 37 have been withdrawn from consideration. Claims 3, 19, 26 and 36 have been cancelled. Applicant's amendments in the response filed 4/22/09 are acknowledged.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 6 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 6 recites "wherein said second plate of itself is not rotatable." It is unclear what is intended by this phrasing, rendering this claim indefinite. Furthermore, claim 1 recites "rotating means for rotating said second plate." Therefore, this claim negates independent claim 1.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 1, 2, 4-11, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza.

9. As to claims 1, 2, 4 and 5, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) and a second plate (Ref. #144) substantially parallel to the first plate and horizontally arranged (Col. 10, lined 41-42; Figure 4). A first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. #156) with a fluid outlet nozzle (Ref. #158) (Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by applicant's specification. A second dispensing means is similarly provided to introduce fluid into a second gap between said second plate and a wafer being treated comprising a fluid supply tube (Ref. #160) and inlet (Ref. #148) (Col. 10, lines 62-64; Figure 10). Aegerter discloses rotating means in the form of a rotor (Ref. #115) and rotor motor assembly (Ref. #124), in accordance with applicant's specification, for rotating the work piece housing, which includes the wafer and second plate, relative to each other about an axis substantially perpendicular to the second plate (Col. 9, lines 62—Col. 10, line 14; Figure 4).

10. Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1), but does not expressly disclose holding means in the form of grippers. Aegerter also does not expressly disclose that the holding means and first plate are coupled to each other to form a holding unit.

Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said second plate.

11. Engesser discloses holding means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be applicant's claimed plate (Page 1, Paragraph [0013], [0015]). The gripping pins mounted to the plate comprise a holding unit as claimed.

12. Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, which is applicant's claimed second plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled.

13. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

14. It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic vibration, no particle can remain sufficiently

strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph [0008]).

15. As to claim 6, Aegerter does not expressly disclose that the second plate is not rotatable.

16. Engesser discloses a device for wet cleaning a wafer where the mask (i.e. plate) is held stationary (Page 2, Paragraph [0020]). The mask corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such that a gap remains, so it is understood to be applicant's claimed plate (Page 1, Paragraph [0013], [0015]). While Engesser only discloses one plate, it is apparent that either the first or second plate as taught by Kim could be held stationary.

17. It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter to include a second plate that is not rotatable as taught by Engesser. One of ordinary skill would have been motivated to make this modification which is advantageous when the liquid between the plate and wafer should experience as little motion in itself as possible, thereby preventing it from reaching an area which is not to be treated by it (Page 2, Paragraph [0020]).

18. As to claims 7 and 8, Aegerter further discloses that a cup (liquid collector) may be disposed about the apparatus, including said holding means, for collecting used processing liquids (Col. 11, lines 22-25). It is understood that if the liquid collector is disposed about the apparatus, the plates are sealed to the liquid collector such that liquid flows into the collector without being lost.

19. As to claim 9, Aegerter does not expressly disclose means for varying distance as defined by applicant's specification to be hydraulic, pneumatic, or electromechanical elements, such as a belt drive or a ball spindle.

20. Engesser discloses distance changing means in the form of a pneumatic cylinder or a spindle (Page 3, Paragraph [0041]).

21. It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter to include means for varying distance as taught by Engesser (Page 3, Paragraph [0041]). One of ordinary skill would have been motivated to add means for varying distance so that the gap between the plate and the wafer can varied to insert and remove a wafer.

22. As to claims 10 and 11, Aegerter teaches that a space gap is maintained between the wafer and the first and second plates while treating the wafer (Col. 10, lines 47-52), but does not expressly teach that this gap is 0.1 to 10mm or 0.5 mm to 5 mm.

23. Engesser discloses a gap of about 0.05 to 1 mm between a wafer and a mask (i.e. plate) (Page 2, Paragraph [0018]).

24. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include a gap of 0.05 – 1 mm between the wafer and each plate as taught by Engesser since Engesser teaches that this gap size prevents thin liquids from running out of the capillary area between the plate and the wafer (Page 2, Paragraph [0018]).

25. As to claim 13, Aegerter further discloses an additional gas dispenser for the first gap (Col. 23, lines 31-34).

26. As to claim 14, Aegerter further discloses outlets, which are openings, in each of the plates that are spaced from each respective inlet. Since each inlet is located in the center of the

plate, which is the rotational center, the spacing means that the outlets do not include the rotational center (Page 10, lines 65-66).

27. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 6, 890,390 to Azar

28. Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

29. As to claim 12, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that the vibrating element is arranged with respect to the second plate facing the wafer such that the ultrasonic waves are substantially directed to the wafer when treated taking an angle of 85-60 degrees to the plane provided for the wafer.

30. Azar discloses an ultrasonic cleaning system where the transducers are oriented at a steering angle, Θ_s which can be modified. The example steering angle provided is thirty degrees, meaning that the ultrasonic waves are directed to the wafer at an angle of sixty degrees (Col. 5, lines 40-45; Figure 6).

31. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Aegerter, Engesser, and Cavazza to include transducers oriented such that the ultrasonic waves are directed towards the second plate at 60-85 degrees as taught by Azar for the benefit of producing maximum acoustic intensity to improve cleaning. Furthermore, since the general conditions the claims are disclosed in the prior art, these optimum or workable ranges could be determined by routine experimentation. (MPEP 2144.05 A).

32. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 4,401,131 to Lawson et al.

33. Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

34. As to claim 15, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that at least one vibrating element is arranged to cover the area of the rotational axis.

35. Lawson discloses a transducer faceplate which is large enough to fully overlie a wafer to be cleaned, including piezoelectric transducer elements for vibration (Col. 2, lines 34-37, 58-60). If the vibrating elements cover the entirety of the wafer, they must cover the area of the rotational axis.

36. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Aegerter, Engesser, and Cavazza, to include a vibrating element arranged to cover the area of the rotational axis for the benefit of producing a uniform acoustic field across the wafer (Col. 1, lines 44-45).

37. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 5,788,453 to Donde et al.

38. Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

39. As to claim 16, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose means for opening and closing holding elements of said holding elements of said holding means during treatment of the wafer. According to applicant's specification, means for opening and closing holding elements are defined as a tooth gear which drives eccentrically movable pins is agitated through a servomotor or each pin is driven through a magnetic or piezoelectric switch.

40. Donde discloses a system of piezoelectric grippers for holding a wafer, and which open and close to grasp a wafer, in accordance with applicant's specification (Col. 3, lines 7-9, 33-37).

41. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, and Cavazza to include piezoelectric grippers as taught by Donde to open and close the holding elements during treatment of a wafer. One of ordinary skill would have been motivated to add piezoelectric grippers for the benefit of reducing contamination because they can serve to grip the wafer without relative frictional motion between the gripper and the wafer, which can adversely generate contaminating particles (Col. 16, lines 1-7).

42. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser and US 2002/0162570 to Cavazza as applied to claim 1 above, and further in view of USPN 6,532,977 to Otsuki et al.

43. Aegerter, Engesser, and Cavazza are relied upon as discussed above with respect to the rejection of Claim 1.

44. As to claim 17, the combination of Aegerter, Engesser, and Cavazza does not expressly disclose that at least one plate at least partly comprises material having a specific sound propagation velocity greater than that of water.

45. Otsuki discloses a cleaning vessel body made of a layer of silicon carbine, which propagates ultrasonic waves in a liquid solution (Col. 2, lines 32-42). The acoustic velocity of the ultrasonic waves propagated through the silicon carbine is 4000 to 20000 m/s. According to applicant, the sound propagation velocity of water is 1500 m/s. Therefore, this material has a sound propagation velocity greater than that of water, and is suited for cleaning equipment.

46. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, and Cavazza to include a plate comprising a material having a sound propagation velocity deferring not more to that of water as taught by Otsuki so that sound propagation of ultrasonic waves can be increase. It is desired to increase sound propagation velocity to enhance cleaning.

47. Claims 22-24 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser , USPA 2002/0162570 to Cavazza, USPA 20040132318 to Kim et al. and 6,890,390 to Azar.

48. As to claims 22-24 and 27, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) (Col. 10, lined 41-42; Figure 4) and a first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. #156) with a fluid outlet nozzle (Ref. #158) (Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of

rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by applicant's specification. Aegerter discloses rotating means in the form of a rotor (Ref. #115) and rotor motor assembly (Ref. #124), in accordance with applicant's specification, are provided for rotating the work piece housing, which includes the wafer and first plate, relatively about an axis substantially perpendicular to the first plate (Col. 9, lines 62—Col. 10, line 14; Figure 4).

49. According to the specification, holding means are defined as gripping means, which are further defined as comprising movable gripping pins. Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1). Aegerter does not expressly disclose gripping pins in accordance with the specification. Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said first plate or adjustment elements in order to direct ultrasonic waves at an angle ά of less than 89° to a wafer when treated, where the adjustment-elements comprise an array of a plurality of transducers with at least one ultrasonic generator to separately agitate said plurality of transducers in a phase-shifted way in order to generate an ultrasonic wave directed from said array of transducers at an angle of less than 89 degrees, that said array of transducers is a two dimensionally arranged plurality of transducers or that the transducer is placed in a slanted plane and is acoustically coupled to an intermediate liquid chamber, which is further acoustically coupled to the first plate.

50. Engesser discloses gripping means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such

that a gap remains, so it is understood to be applicant's claimed plate (Page 1, Paragraph [0013], [0015]).

51. Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, i.e. a plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled. The transducer is further coupled to a tank for holding liquid, which is applicant's intermediate liquid chamber (Page 2, Paragraph [0032]). As the vibrations are applied to the substrate and plate through the transducer's waves generated in the chamber, the liquid chamber is acoustically coupled to the first plate.

52. Kim discloses adjustment-elements in the form of a positioning system (Ref. #620) that can raise, lower, or tilt the acoustic transducer (Ref. #612) (Page 4, Paragraph [0043]). It is shown that this tilting can result in the direction of ultrasonic waves at an angled of less than 89° to a wafer when treated (Figures 6, 14). The transducer (Ref. #612) is thus placed in a slanted plane (Figures 6, 14) by the adjustment element (Page 5, Paragraph [0044]). Kim teaches that the acoustic transducer can be positioned to direct acoustic energy to either surface of the wafer (Page 5, Paragraph [0044]).

53. Azar discloses a cleaning system with a plurality of transducer elements arranged in an array which may be a matrix array (two dimensional), with a plurality of drivers (ultrasonic generator) such that each driver is connected to a transducer (Col. 3, lines 18-24; Col 7, lines 32-33). Each driver generates an electric signal such that each transducer element separately vibrates in response to generate an ultrasonic wave (Col. 3, lines 25-30). Phase steering can be

accomplished by controlling the phase of each transducer (Col. 5, lines 27-29). Azar teaches an example where an ultrasonic wave is directed at an angle of 30°, which is less than 89° (Col. 5, lines 41-42).

54. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

55. It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic vibration, no particle can remain sufficiently strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph [0008]). It would have been obvious to one of ordinary skill in the art to further modify the apparatus taught by Aegerter, Engesser, and Cavazza to include an adjustment element in a slanted plane as taught by Kim so that the acoustic energy being applied to the back surface of the semiconductor wafer can be controlled (Page 4, Paragraph [0043]). One of ordinary skill would have further been motivated to add a liquid chamber so that there is a constant supply of cleaning liquid in which to produce cavitation.

56. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, Cavazza and Kim to include a two dimensional array of transducers as taught by Azar in order to direct ultrasonic energy onto a

localized area on a substrate surface (Col. 2, lines 37-39). One of ordinary skill would have been motivated to add a plurality of transducers to uniformly clean the surface of a substrate (Col. 3, lines 10-12).

57. As to claims 28-30, Aegerter does not expressly disclose that the quotient of the distance a of the first plate to the wafer surface facing said first plate and the mean distance d between the centers of two adjacent transducers of the array is greater than 5 (a/d>5); that the mean distance d between the centers of two adjacent transducers of the array is smaller than 2 mm; wherein the width D of the array of the transducers is at least three times as big as the distance d1 of the first plate to the wafer surface facing said plate.

58. Azar discloses the parameters of the array including the center-to-center spacing between transducer elements, the width of each element, the total aperture dimension, and the elevation dimension (Col. 5, lines 1-4). Azar teaches that the parameters of the array can be controlled to produce steering and focusing (Col. 3, lines 53-60; Col. 7, lines 26-28). It would have been obvious to one of ordinary skill at the art at the time of the invention to further modify the device taught by Aegerter, Engesser, Cavazza and Kim to include the adjustable parameters as taught by Azar. Since the general conditions the claims are disclosed in the prior art, these optimum or workable ranges could be determined by routine experimentation in order to optimize ultrasonic cleaning (MPEP 2144.05 A).

59. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser , USPA 2002/0162570 to Cavazza,

USPA 20040132318 to Kim et al. and 6,890,390 to Azar as applied to claim 24 above, and further in view of USPN 5,762,708 to Motoda et al.

60. Aegerter, Engesser, Cavazza, Kim and Azar are relied upon as discussed above with respect to the rejection of Claim 25.

61. As to claim 25, Cavazza further discloses that the intermediate liquid chamber includes an annular duct (channel #9) (Page 2, Paragraphs [0027], [0032]; Figure 3), but the combination of Aegerter, Engesser, Cavazza, Kim and Azar does not expressly disclose that the intermediate liquid chamber includes an annular gas suction nozzle.

62. Motoda discloses a substrate treatment apparatus comprising an annular drain cup comprising an air (gas) suction path (i.e. nozzle) (Col. 4, lines 17-34; Figure 1).

63. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter, Engesser, Cavazza, Kim and Azar to include an annular gas suction path as taught by Motoda for the benefit of assisting liquid collection in the annular duct.

64. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 6,632,292 to Aegerter et al. in view of USPA 2002/0050244 to Engesser , USPA 2002/0162570 to Cavazza, and USPA 20040132318 to Kim et al.

65. As to claim 31, Aegerter discloses an apparatus for wet-treating a wafer comprising a first plate (Ref. #138) (Col. 10, lined 41-42; Figure 4) and a first dispensing means for introducing a fluid into a first gap between said first plate and a wafer when being treated is provided in the form of a fluid supply tube (Ref. #156) with a fluid outlet nozzle (Ref. #158)

(Col. 10, lines 56-60; Figure 4). The fluid supply tube extends centrally through the axis of rotation (Col. 10, lines 60-61). This structure is in accordance with the dispenser as described by applicant's specification. Aegerter discloses rotating means in the form of a rotor (Ref. #115) and rotor motor assembly (Ref. #124), in accordance with applicant's specification, are provided for rotating the work piece housing, which includes the wafer and first plate, relatively about an axis substantially perpendicular to a second plate (Col. 9, lines 62—Col. 10, line 14; Figure 4). The second plate (Ref. #144) is substantially parallel to the first plate (Col. 10, lined 41-42; Figure 4) with second dispensing means similarly provided to introduce fluid into a second gap between said second plate and a wafer being treated comprising a fluid supply tube (Ref. #160) and inlet (Ref. #148) (Col. 10, lines 62-64; Figure 10).

66. According to the specification, holding means are defined as gripping means, which are further defined as comprising movable gripping pins. Aegerter discloses wafer support members (Ref. #240) for clamping the wafers (Col. 12, lines 44-55) in the form of fasteners (Ref. #307) for holding a wafer between said first and seconds plates, substantially parallel to said plates (Col. 9, lines 52-60; Figure 1). Aegerter does not expressly disclose gripping pins in accordance with the specification. Aegerter does not expressly disclose at least one vibrating element acoustically coupled to at least said first plate or adjustment elements in order to direct ultrasonic waves at an angle ά of less than 89° to a wafer when treated.

67. Engesser discloses gripping means in the form of gripping pins which are movable through a mechanism (Page 3, Paragraph [0039]). The gripping pins are mounted to a mask, which corresponds to the shape of the wafer to be cleaned, and does not touch the wafer such

that a gap remains, so it is understood to be applicant's claimed plate (Page 1, Paragraph [0013], [0015]).

68. Cavazza discloses a transducer that generates ultrasonic vibrations to clean a substrate facing downward (Page 1, Paragraphs [0011]-[0015]; Page 3, Paragraph [0032]). A working surface directed upward and placed under the substrate, i.e. a plate, is mechanically connected to the ultrasound transducer (Page 1, Paragraphs [0011]-[0015]), and therefore is acoustically coupled. Kim discloses adjustment-elements in the form of a positioning system (Ref. #620) that can raise, lower, or tilt the acoustic transducer (Ref. #612) (Page 4, Paragraph [0043]). It is shown that this tilting can result in the direction of ultrasonic waves at an angled of less than 89° to a wafer when treated (Figures 6, 14). The transducer (Ref. #612) is thus placed in a slanted plane (Figures 6, 14) by the adjustment element (Page 5, Paragraph [0044]). Kim teaches that the acoustic transducer can be positioned to direct acoustic energy to either surface of the wafer (Page 5, Paragraph [0044]).

69. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus taught by Aegerter to include gripping pins and to couple the holding means and first plate to form a holding unit as taught by Engesser in order to hold the wafer. One of ordinary skill would have been motivated to use gripping pins to insure that the wafer is securely held in place during cleaning.

70. It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus taught by Aegerter and Engesser to include a vibrating element acoustically coupled to the second plate as taught by Cavazza in order to improve cleaning of the wafer. Cavazza teaches that due to the ultrasonic vibration, no particle can remain sufficiently

strongly attached to the face to be treated so as to resist the liquid and gravity (Page 1, paragraph [0008]). It would have been obvious to one of ordinary skill in the art to further modify the apparatus taught by Aegerter, Engesser, and Cavazza to include an adjustment element in a slanted plane as taught by Kim so that the acoustic energy being applied to the back surface of the semiconductor wafer can be controlled (Page 4, Paragraph [0043]).

Response to Arguments

71. Applicant's arguments filed 4/22/2009 have been fully considered but they are not persuasive.

72. Regarding USPN 6,632,292 to Aegerter, Applicant argues that it is not understood how it would be possible with Aegerter's device to rotate the holding means and the second plate relative to each other when move the holding means and the second plate are rotated together. However, Applicant is reminded that the claim does not recite that the wafer and second plate rotate **relatively against** each other, as was recited in withdrawn claim 18. Claim 1 recites "**relative to each other.**" Relative is defined as having a relation, connection, or necessary dependence on another thing. Therefore, since the holding means and second plate are rotated together, they read on the claim limitation of rotating relative to each other because there is a necessary relationship between the two.

73. Regarding claim 22, Applicant argues that Aegerter lacks too many features as to be considered close prior art to this embodiment of the present invention. However, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); In re

Merck & Co., Inc., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Furthermore, since reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention (*In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991), Examiner is able to use as many references as necessary.

Conclusion

74. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

75. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

76. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NAOMI BIRBACH whose telephone number is (571)270-7367. The examiner can normally be reached on Monday-Friday, 8:00am-5:30pm.

77. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

78. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. B./
Naomi Birbach
Examiner, Art Unit 1792
/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 1792